DOCUMENT RESUME

ED 288 399 FL 017 039

AUTHOR Baldwin, Dare A.
TITLE Color Similarity in Children's Classifications and Extensions of Object Labels.
PUB DATE Aug 86
NOTE 9p.; In: Papers and Reports on Child Language Development, Volume 25, August 1986; see FL 017 037.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Child Language; *Classification; Cognitive Development; *Color; Comparative Analysis; *Error Patterns; *Language Acquisition; Language Processing; Language Research; Linguistic Theory; *Nouns; Semantics; Toddlers

ABSTRACT

A study investigated whether children expect color similarity to be less important than form similarity in object label extensions. Twenty 2-year-olds and 20 3-year-olds were asked to sort objects similar in either color or form in two different situations: (1) the "No Label" condition where children were asked to help the puppet put objects that are alike on the same page in the picture-book; and (2) the "Novel Label" condition where children were asked to do the same but told the puppet used words they had never heard before and introduced items with the novel labels. In the first test, both 2-year-olds and 3-year-olds who were offered novel labels for objects sorted them by form similarity. In the second test, the younger children sorted objects more often on the basis of color while the older children sorted almost entirely based on form similarity. These results suggest that color is a relatively uninformative property with regard to objects' category membership, while form appears to be especially predictive of category membership. This may explain why form-based overextension errors are not unusual in children's early use of object labels, while color overextensions are far less common. It may also explain why children tend to learn basic category level labels before those at a higher or lower level of classification. (MSE)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

PRCLD 25
1986

ED288399

Color Similarity in Children's Classifications and Extension of Object Labels

Dare A. Baldwin
Stanford University

One task young children devote considerable energy to is that of learning names for objects and object classes, such as *dog* and *ball*. Moreover, this is one endeavor in which young children display considerable skill -- they learn many such object labels early and rapidly. This is not to say, however, that children's learning of object labels is completely error-free. At early ages, children make some striking mistakes in their use of object labels. For instance, young children frequently overextend a label to objects for which adults would not use the label. An example of this is when a child uses the label *ball* to refer to oranges and doorknobs as well as balls.

The overextension errors children make are interesting because they seem to disclose children's expectations for how object labels will package the object world. It is revealing, for instance, that children frequently overextend a label to objects similar in form to the objects for which adults use the label (e.g., Clark, 1973; Nelson, 1974; Gentner, 1978; Tomikawa & Dodd, 1980). Such form-based overextension errors seem to suggest that very young children expect that object labels will refer to a class of objects that share similar forms.

Overextension errors are also revealing for their neglect of certain properties. That is, certain properties *never* seem to appear as the basis for children's overextension errors. Neglect of this kind suggests that children view the absent properties as irrelevant to the way that object labels group objects. One such neglected property of particular note is color: children never overextend object labels solely on the basis of shared color (Clark, 1973; Nelson, 1974). The present study was designed to demonstrate that children refrain from overextending labels on the basis of color precisely because they view color as relatively uninformative about the extension of object labels.

The absence of color as the basis for children's overextension errors is especially striking because young children frequently group objects together on the basis of color when performing standard classification tasks (e.g., Brian & Goodenough, 1929; Melkman, Koriat, & Pardo, 1976; Melkman, Tversky, & Baratz, 1981; Suchman & Trabasso, 1966). That is, children between the ages of about two and four will often choose to group objects that share only similar color (e.g., a *red apple* and a *red suitcase)* instead of grouping objects which share similar form but differ in color (e.g., a *red apple* and a *green apple)*. Children's interest in color at the expense of form wanes with development: by four or five years of age, children given such a classification task group objects almost exclusively on the basis of similar form rather than similar color.

It should be noted that young children's interest in color similarity as a basis for grouping objects fails to attain the status of an overwhelming preference, even when at its height. Nevertheless, the fact remains that they show *some* willingness to group objects that share only color. Children's apparent *unwillingness* to

FL017039

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

E. Clark

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

generalize object *labels* solely on the basis of color similarity thus appears in stark contrast with their willingness to use color similarity for grouping objects in standard classification tasks. If reliable, this discrepancy would suggest that children avoid color when extending object labels not because it is uninteresting, but because they expect it to be irrelevant to the extension of these words.

Children may avoid extending labels solely on the basis of color for another reason: they may expect labels to refer to objects similar in form. This expectation would lead children to maximize form similarity in their extension of labels, and at the same time prevent them from extending labels to objects that share only color and not form. Considerable evidence already exists that children possess an expectation that object labels will group objects similar in form (e.g., Baldwin, 1985; Gentner, 1978; Markman & Hutchinson, 1984; Tomikawa & Dodd, 1980). However, we do not yet know whether children expect form similarity to be relatively more important than color similarity in the extension of object labels.

The analysis that I am offering here follows the same line of reasoning offered by Markman and Hutchinson (1984). They demonstrated that young children prefer to extend object labels to categorically related objects, even though children find thematic relations more salient than categorical relations when object labels are not involved. Based on this evidence, Markman and Hutchinson argue that children constrain labels to refer to categorically related objects, and therefore view thematic relations as irrelevant to the meanings of these words. I am suggesting that young children may possess similar early expectations concerning color and form similarity. Namely, children may expect form similarity to be more relevant than color similarity to the extension of object labels.

Children's reliance on an expectation that form is more relevant than color to object label extension would yield the pattern of overextension errors we see, and it would also help explain the relative speed and ease with which children learn object labels. "Form - relevant" and "Color - irrelevant" expectations should enhance children's acquisition of object labels for several reasons. For one thing, object labels across the world's languages show a marked tendency to group objects that are similar in form (e.g., Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976). Moreover, color is not very important in the way that objects are grouped by object labels (cf. Quine (1969) for a related argument). This is easily observed by considering two facts: a) object labels at all levels of generality frequently refer to objects that are heterogeneous in color (e.g., *books, games, sweaters),* and b) information about the color of an object is not very helpful when trying to decide which label might apply to that object (e.g., knowing that an object is *yellow* is not especially valuable for deciding what to call that object, since it could be called such different things as a *canary,* a *raincoat,* or a *banana).* The critical point here is that form is highly predictive of an object's category membership, and hence the label it falls under, while color is not. If children have expectations about object label meanings that match these facts, their discovery of the correct referents of object labels will be greatly facilitated.

I investigated whether children expect color similarity to be less important than form similarity in object label extensions by means of the methodology created by Markman & Hutchinson (1984). This involved comparing how children sort

BEST COPY AVAILABLE

objects similar in either color or form in two different situations: a) when they are asked to extend a novel object label, and b) when no novel labels are offered and children are merely asked to group together objects that are alike. Young children should be willing to group objects by color similarity when novel labels are not involved. However, if children's extension of object labels is indeed guided by an expectation that form similarity will be more important than color similarity, they should be much less willing to sort objects similar only in color (and consequently more likely to sort by form similarity) when asked to extend a novel label to a new referent.

Method

Twenty two-year-olds (2;01 - 2;11, mean age = 2;6) and twenty three-year-olds (3;01 - 3:10, mean age = 3;4) participated in the study. Children were introduced to a puppet, who asked them to help in grouping pictures of objects to complete a "picture-book." Half of the children participated in a *No Label* condition. They were told that their job was to help the puppet put objects that are alike on the same page in the picture-book. First, children saw a target object (e.g., a *red apple)* while the puppet inquired "Do you see this one?" They were then presented with two choice objects (e.g., color choice: *red suitcase;* form choice: *green apple)* as the puppet asked "Can you find another one?" Children's selections were inserted into the picture-book beneath the target object, after which the puppet asked "How did you decide that this one was the other one?"

The other half of the children participated in a *Novel Label* condition involving nonsense labels such as *som, mip,* and *fud.* As in the *No Label* condition, children in the *Novel Label* condition were asked to help the puppet put objects that are alike on the same page in the picture-book. However, these children were also told that the puppet sometimes spoke in puppet-talk, which meant that he used words they had never heard before, and that part of the game was to figure out what his words meant. Children were shown the target object as the puppet said, "This is a [novel label]. Can you say [novel label]?" They were then presented with the two choice objects while the puppet asked, "Can you find another [novel label]?" After inserting the child's selection in the picture-book, the puppet asked "How did you decide that this was the other [novel label]?"

Children in both the *No Label* and *Novel Label* conditions sorted ten object triads that pitted color similarity against form similarity. Table 1 shows the ten object triads used in the study.

Table 1

Stimuli Used in Determining Children's Matching Preferences

Target Object	Color Choice	Form Choice
green axe	green car	blue axe
green cabbage	green flashlight	red cabbage
green bird	green leaf	blue bird
blue table	blue jacket	brown table
brown squirrel	brown sock	black squirrel
orange carrot	orange umbrella	white parsnip
red apple	red suitcase	green apple
red butterfly	red drum	blue butterfly
yellow cheese	yellow key	orange cheese
yellow banana	yellow whistle	red/green plantain

Results and Discussion

Children's sorting performance was initially analyzed with a 2 X 2 ANOVA, which revealed a significant main effect of age, $F(1, 36) = 15.75$, $p < .001$, a significant main effect of labeling condition, $F(1, 36) = 10.32$, $p < .01$, and a significant age X labeling condition interaction, $F(1, 36) = 4.32$, $p < .05$. Follow-up analyses using Tukey's W procedure were conducted to discover the locus of the interaction effects. Table 2 reports the mean number of form choices children made in the two labeling conditions.

Table 2

Children's Sorting in the Presence and Absence of Novel Object Labels

(mean number of form choices out of ten)

Age	No Label Condition	Novel Label Condition
2 years	6.0 (= chance)	8.8 (> chance)
3 years	9.2 (> chance)	9.8 (> chance)

Note: N = 40

Looking first at children's sorting when no labels were involved, we see that two- and three-year-olds sorted objects differently, Tukey's $W(36) = 2.8$, $p < .01$. Two-year-olds who heard no labels frequently selected a color associate to match with the target: they chose on the basis of color similarity an average of four times out of the ten object triads. In contrast, three-year-olds who heard no labels neglected color similarity to sort almost entirely on the basis of form similarity. This developmental trend to focus more exclusively on form similarity as opposed to color similarity replicates previous findings (e.g., Brian & Goodenough, 1929; Melkman, Koriat, & Pardo, 1976; Melkman, Tversky, & Baratz, 1981; Suchman & Trabasso, 1966).

Differences also emerged between the sorting of two-year-olds who participated in the *Novel Label* condition and those who sorted without hearing novel labels, Tukey's $W(36) = 2.8$, $p < .01$. When two-year-olds were asked to discover a new referent of a novel label, they very frequently selected on the basis of form similarity. Thus two-year-olds who heard novel labels concentrated on sorting by form similarity much more often than two-year-olds who heard no novel labels. This effect of the novel labels on two-year-olds' sorting also generalized across the ten different object triads, matched pairs $t(9) = 7.80$, $p < .001$. In fact, two-year-olds were more likely to pick the form similarity choice in every one of the ten triads if the target was presented in conjunction with a novel label. In summary, two-year-olds in the present study showed much less interest in color when extending novel labels than when they sorted objects in the absence of labels. They treated form as relatively more important than color for guiding their extension of novel object labels.

Three-year-olds showed a high level of form sorting in both the *No Label* and *Novel Label* conditions. Although they showed slightly greater attention to form similarity when extending novel labels as opposed to when no labels were presented, this difference was not significant. Three-year-olds, then, devoted the majority of their attention to sorting objects on the basis of form similarity, regardless of whether they were engaged in discovering a new referent for a novel object label.

A somewhat different analysis was conducted to investigate further the impact of the novel labels on children's sorting performance. I examined how likely individual children were to show a preference for color or form choices in the case where they heard novel labels as opposed to when no labels were offered. Children were credited with a preference if they reached a criterion of seven choices of the same type out of the ten triads. The results of this analysis appear in Table 3 for the two-year-olds, and in Table 4 for the three-year-olds.

Let us first consider two-year-olds' sorting preferences when no labels were involved: we see that very few two-year-olds actually *preferred* to group by color as opposed to form. In fact, just as many two-year-olds displayed a form preference as displayed a color preference in the *No Label* condition. In contrast, not even a single two-year-old displayed a color preference when extending novel labels: every two-year-old who heard novel labels preferred to sort on the basis of form similarity. The preference data thus provide additional evidence that two-year-olds view form similarity as more relevant than color similarity to the task of discovering the referents of novel object labels.

Table 3

The Number of Children Demonstrating a Preference in the Presence and Absence of Novel Object Labels

(Preference = at least 7 choices of one type out of ten)

TWO-YEAR-OLDS

Choice Type	No Label	Novel Label
Color	3	0
Form	3	10
No Preference	4	0

The effect of the novel labels on children's sorting preferences was less dramatic in the case of the three-year-olds: only one additional three-year-old showed a form preference in the *Novel Label* condition relative to the *No Label* condition. However, any tendency that the novel labels had to increase three-year-olds' form-sorting would have been obscured by their overwhelming preference to sort by form even when no labels were involved. It seems noteworthy, nevertheless, that three-year-olds, like two-year-olds, were unanimous in preferring to sort on the basis of form similarity when they were engaged in discovering the referents of novel object labels.

Table 4

The Number of Children Demonstrating a Preference in the Presence and Absence of Object Labels

(Preference = at least 7 choices of one type out of ten)

THREE-YEAR-OLDS

Choice Type	No Label	Novel Label
Color	0	0
Form	9	10
No Preference	1	0

Concluding Remarks

To conclude, I would like to emphasize several implications of the present research. I have suggested that color is a relatively uninformative property with regard to objects' category membership. That is, noticing a color similarity between objects may not be very helpful in deciding whether those objects share membership in the same category. Form similarity, by contrast, appears to be especially predictive of objects' category membership: we can typically identify the category membership of an object with a high degree of accuracy by noting its similarity in form to other objects whose category membership is known.

When children as young as two are engaged in learning object labels that refer to object categories, they demonstrate a marked tendency to ignore similarities of color in favor of attending to similarities of form. Thus two-year-old children demonstrate an early expectation that form similarity will be more valuable than color similarity for identifying the category members to which object labels refer. This expectation explains why form-based overextension errors are not unusual in children's early use of object labels, while color-based overextension errors are utterly lacking. Moreover, these findings imply that very young children possess a "Form - relevant / Color - irrelevant" expectation that matches the relative informativeness of these properties in the world of everyday object categories. This efficacious match helps explain the relative speed and ease with which children learn object labels and their underlying categories.

Children's emphasis on form similarity in their expectations about object label extensions also helps to explain their tendency to learn basic level labels prior to labels at either higher (superordinate) or lower (subordinate) levels of classification. The basic level of categorization is unique in capturing groups of objects that are maximally similar in form, while at the same time being maximally dissimilar in form from objects that are members of other categories. Therefore an expectation that form similarity will be important to object label extensions will lead children to sort objects into basic-level categories when trying to find the referents of new object labels.

Although children avoided extending novel labels solely on the basis of color similarity in the present study, it seems unlikely that children ignore color in their hypotheses about word-meanings in any absolute fashion. I say this for two reasons. First, many children have already learned a number of color labels (e.g., *red, green)* by the age at which they participated in this study. Learning color names clearly involves recognizing that color similarity can be relevant to word-meanings. Second, evidence from Gelman & Markman (1984) indicates that young children are in fact quite sensitive to the way color is used in language for making fine-grained contrasts within categories (e.g., *red apples* vs. *green apples)*.

In closing, I would like to reiterate a fundamental point: the present study provides additional evidence that children possess special expectations about the meanings that new words are likely to have. It is true that these expectations sometimes lead children into error, such as when they overextend labels to objects similar in form. However, the errors caused by expectations such as the "Form - relevant / Color - irrelevant" one I have demonstrated are minimal when compared with the powerful advantages they confer.

References

Baldwin, D. A. (1985, April). *Exploring children's expectations about word-meanings.* Paper presented at the biennial meeting of the Society for Research in Child Development, Toronto, Ontario.

Brian, C. R., & Goodenough, F. L. (1929). The relative potency of color and form perception at various ages. *Journal of Experimental Psychology, 12,* 197-213.

Clark, E. V. (1973). What's in a word? On the child's acquisition of semantics in his first language. In T. E. Moore (Ed.), *Cognitive development and the acquisition of language.* New York: Academic Press, 67-110.

Gelman, S. A., & Markman, E. M. (1985). Implicit contrast in adjectives vs. nouns: implications for word-learning in preschoolers. *Journal of Child Language, 12,* 125-143.

Gentner, D. (1978). What looks like a jiggy but acts like a zimbo? A study of early word meaning using artificial objects. *Papers and Reports on Child Language Development, 15,* 1-6.

Markman, E. M., & Hutchinson, J. E. (1984). Children's sensitivity to constraints on word meaning: Taxonomic vs. thematic relations. *Cognitive Psychology, 16,* 1-27.

Melkman, R., Koriat, A., & Pardo, K. (1976). Preference for color and form in preschoolers related to color and form differentiation. *Child Development, 47,* 1045-1050.

Melkman, R., Tversky, B., & Baratz, D. (1981). Developmental trends in the use of perceptual and conceptual attributes in grouping, clustering, and retrieval. *Journal of Experimental Child Psychology, 31,* 470-486.

Nelson, K. (1974). Concept, word and sentence: Interrelations in acquisition and development. *Psychological Review, 81,* 267-285.

Quine, W. V. O. (1969). Natural kinds. In W. V. O. Quine, *Ontological Relativity and Other Essays.* New York: Columbia University Press.

Rosch, E., Mervis, C. B., Gray, W., Johnson, D., & Boyes-Braem, P. (1976). Basic objects in natural categories. *Cognitive Psychology, 3,* 382-439.

Suchman, R. G., & Trabasso, T. (1966). Color and form preference in young children. *Journal of Experimental Child Psychology, 37,* 439-451.

Tomikawa, S. A., & Dodd, D. H. (1980). Early word meanings: Perceptually or functionally based? *Child Development, 51,* 1103-1109.

Acknowledgments

My greatest appreciation to the children who participated in this study, and to the staff of Poppy Children's Center, The Learning Center, Children's Community Preschool, Buttons & Bows Montessori Preschool, Ventura Child Care, and Little Rascals Children's Center for their help. I am grateful to Marjorie S. Horton, Ellen M. Markman, Louis J. Moses, and Laura A. Thompson for their valuable comments concerning this research.